

PATENT COOPERATION TREATY

MAR 03 2000

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

FLIESLER DUBB
MEYER & LOVEJOY

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PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing (day/month/year) 28 FEB 2000	
Applicant's or agent's file reference: TEGL1071WO	
IMPORTANT NOTIFICATION	
International application No. PCT/US98/23297 ✓	International filing date (day/month/year) 03 NOVEMBER 1998
Priority Date (day/month/year) 19 NOVEMBER 1997	
Applicant TEGAL CORPORATION	

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer BEN UTECH <div style="text-align: right;"> DEBORAH THOMAS PARALEGAL SPECIALIST </div>
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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TEGL1071WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US98/23297	International filing date (<i>day/month/year</i>) 03 NOVEMBER 1998	Priority date (<i>day/month/year</i>) 19 NOVEMBER 1997
International Patent Classification (IPC) or national classification and IPC IPC(6): B44C 1/22; HO1L 21/302 and US Cl.: 216/71; 438/714		
Applicant TEGAL CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

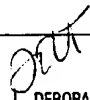
2. This REPORT consists of a total of 4 sheets.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 0 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 13 MAY 1999	Date of completion of this report 20 DECEMBER 1999
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer BEN UTECH Telephone No. (703) 308-0661
Facsimile No. (703) 305-3230	 DEBORAH THOMAS PARALEGAL SPECIALIST

I. Basis of the report

1. This report has been drawn on the basis of *(Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments):*

☒ the international application as originally filed.

☒ the description, pages 1-10, as originally filed.

pages NONE, filed with the demand.

pages NONE, filed with the letter of _____.

pages _____, filed with the letter of _____.

☒ the claims, Nos. 1-38, as originally filed.

Nos. NONE, as amended under Article 19.

Nos. NONE, filed with the demand.

Nos. NONE, filed with the letter of _____.

Nos. _____, filed with the letter of _____.

☒ the drawings, sheets/fig 1-8, as originally filed.

sheets/fig NONE, filed with the demand.

sheets/fig NONE, filed with the letter of _____.

sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☒ the description, pages NONE.

☒ the claims, Nos. NONE.

☒ the drawings, sheets/fig NONE.

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box Additional observations below (Rule 70.2(c)).

4. Additional observations, if necessary:

NONE

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. STATEMENT**

Novelty (N)	Claims	<u>(Please See supplemental sheet)</u>	YES
	Claims	<u>(Please See supplemental sheet)</u>	NO
Inventive Step (IS)	Claims	<u>(Please See supplemental sheet)</u>	YES
	Claims	<u>(Please See supplemental sheet)</u>	NO
Industrial Applicability (IA)	Claims	<u>(Please See supplemental sheet)</u>	YES
	Claims	<u>(Please See supplemental sheet)</u>	NO

2. CITATIONS AND EXPLANATIONS

Claims 1-5, 8, 13, 20, 27, and 29 lack novelty under PCT Article 33(2) as being anticipated by Ohno et. al.(6-1989').

Ohno et. al. disclose a process for rie etching a Cu layer on a wafer in a plasma comprised of (SiCl₄+N₂) with the wafer heated to a temperature of at least 250 C in order to improve the profile of the etched Cu layer. A resistance heater is embedded in the wafer chuck which is located inside the rie apparatus, and is used to heat the wafer to a temperature of at least 250 C.

Claims 20, and 29 lack novelty under PCT Article 33(2) as being anticipated by Kinoshita (JP07-130,712).

Kinoshita discloses a process for rie etching a Pt film on a wafer using a plasma comprised of Cl₂ with the wafer heated to a temperature of at least 350 C in order to improve the profile of the etched Pt layer. A resistance heater which is embedded in the chuck is located inside the rie apparatus, and is used to heat the wafer to a temperature of at least 350 C.

Claims 10, 16, 20-21, 25-26, and 38 lack novelty under PCT Article 33(2) as being anticipated by Krogh et. al. (1990').

Krogh et. al. disclose a process for rie etching Si on a wafer using a plasma comprised of (CHCl₃+N₂). The wafer is supported in the rie etching apparatus by a wafer chuck. The wafer is clamped to the chuck which has helium gas supplied to it at a pressure between (1-9) torr. The He gas contacts the back surface of the wafer which faces the wafer chuck; and acts as a heat transfer gas between the wafer, and the chuck. The wafer is maintained at a temperature of (86-116) C. The pressure of the He gas supplied to the wafer chuck is decreased from (9 to 1) torr which leads to an increase in the temperature of the wafer from (86 to 116) C.

Claims 1-5, 8-9, 13, 18-19, and 33-34 lack an inventive step under PCT Article 33(3) as being obvious over either Kinoshita or Ohno et. al. as applied above.

Kinoshita or Ohno et. al. as applied above fail to disclose the following aspects of applicant's claimed invention:
-the specific wafer temperature claimed by the applicant for (Continued on Supplemental Sheet.)

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

V. 1. REASONED STATEMENTS:

The report as to Novelty was positive (YES) with respect to claims 6-7, 9, 11-12, 14-15, 17-19, 22-24, 28, 30-37.

The report as to Novelty was negative (NO) with respect to claims 1-5, 8, 10, 13, 16, 20-21, 25-27, 29, 38.

The report as to Inventive Step was positive (YES) with respect to claims 6-7, 11-12, 14-15, 17, 23-24, 28, 31, 35-37.

The report as to Inventive Step was negative (NO) with respect to claims 1-5, 8-10, 13, 16, 18-22, 25-27, 29-30, 32-34, 38.

The report as to Industrial Applicability was positive (YES) with respect to claims 1-38.

The report as to Industrial Applicability was negative (NO) with respect to claims NONE.

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

their etch process; and

-the specific rate of heating up the wafer during the beginning of the etch process in which the wafer temperature is ramped up

It would have been prima facie obvious to employ any of a variety of different wafer temperatures during the conduction of the rie etch processes conducted above including those claimed by the applicant. It would have been prima facie obvious to employ any of variety of different rates of heating up the wafer at the beginning of any of the etch processes taught above including those claimed by the applicant. These are all well known variables in the plasma etching arts which are known to effect both the rate, and the quality of the plasma etching process. Further, the selection of particular values for these variables would not have necessitated any undo experimentation which would have been indicative of a showing of unexpected results.

Claims 22, 30, and 32 lack an inventive step under PCT Article 33(3) as being obvious over Kinoshita as applied above.

Kinoshita as applied above fail to disclose the following aspects of applicant's claimed inventions:

-the specific usage of a thermal transfer gas such as He which is supplied to the back surface of a wafer to be rie etched on a cathode with the specific He gas pressures claimed by the applicant

It would have been obvious to one skilled in the art to employ a heated cathode in the rie etching process taught by Kinoshita as disclosed above which is equipped with means for supplying a thermal transfer gas such as He to the back surface of the wafer to be rie etched via the cathode based upon the following. The usage of a heated cathode equipped with means for supplying a thermal transfer gas such as He to the backside of a wafer to be rie etched on the cathode is conventional or at least well known in the semiconductor processing arts. Further, this would simply provide an obvious way to desirably improve the heat transfer between the wafer to be rie etched; and the heated wafer support (ie.-the cathode).

It would have been prima facie obvious to employ any of a variety of different thermal transfer pressures for the He in the wafer chuck including those claimed by the applicant. These are all well known variables in the plasma etching art which are known to effect both the rate, and the quality of the plasma etching process. Further, the selection of particular values for these variables would not necessitate any undo experimentation which would have been indicative of a showing of unexpected results.

Claims 1-38 possess industrial utility in the area of semiconductor manufacturing.

Claims 6-7, 11-12, 14-15, 17, 23-24, 28, 31, and 35-37 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the following:

-the conduction of a rie etch process in which the pressure of a heat transfer gas supplied to the back side of a wafer resting on a cathode is adjusted in order to increase the temperature of the wafer during the etching process

----- NEW CITATIONS -----

NONE